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Managing Data Quality With ERP Systems - Insights From The Insurance Sector

Paul Glowalla
University of Cologne, Cologne, Germany, glowalla@wiso.uni-koeln.de

Ali Sunyaev
University of Cologne, Cologne, Germany, sunyaev@wiso.uni-koeln.de

MANAGING DATA QUALITY WITH ERP SYSTEMS – INSIGHTS FROM THE INSURANCE SECTOR

Glowalla, Paul, University of Cologne, Albertus-Magnus-Platz, 50923 Cologne, Germany, glowalla@wiso.uni-koeln.de

Sunyaev, Ali, University of Cologne, Albertus-Magnus-Platz, 50923 Cologne, Germany, sunyaev@wiso.uni-koeln.de

Abstract

Data quality management (DQM) gains importance due to the increasing amount and diversity of data as well as data's critical impact on organizational success. Enterprise resource planning (ERP) systems, which are used in most manufacturing and service organizations, provide a platform for data integration. The information-intensive insurance sector, with its complex products and distribution structure, underlies an unprecedented number of mergers and acquisitions as well as numerous regulations. Despite these specific characteristics and entailed data quality issues, there is a lack of sector-specific research of how ERP systems are used for DQM. We examine ERP systems' use for DQM in the insurance sector by conducting semi-structured expert interviews. This study shows that ERP systems are used for integration after mergers and acquisitions and to fulfill regulations. ERP systems provide a starting point for organization-wide data analysis due to their positive impact on data quality. However, cultural and managerial challenges need to be addressed in research as well as in practice in order to lever the potential of diverse data for analysis. Thus, we present areas for further research and provide guidance for future use of ERP systems in DQM.

Keywords: Data quality, ERP system, insurance, mergers and acquisitions, regulations, data analysis, expert interviews.

1 Introduction

Data quality is critical to organizational success since organizations process vast quantities of data (Madnick et al., 2009; Heinrich et al., 2008) and poor data quality is estimated to cost a typical company 10% or even 20% of its revenue (Redman, 2004). Enterprise resource planning (ERP) systems provide a platform for integrating data and processes (Davenport, 1998) and, thus, are a basis for long-term data quality improvement (cf. Batini et al., 2009). Today, most organizations use ERP systems, regardless of being a manufacturing or service organization (Botta-Genoulaz and Millet, 2006). We conduct sector-specific research because information system (IS) activities differ across sectors and research within the service sector reveals different use of ERP systems compared to the manufacturing sector (Glowalla and Sunyaev, 2012a; Botta-Genoulaz and Millet, 2006). We focus on the information-intensive insurance sector and its data quality challenges, for instance, due to mergers and acquisitions (M&A) and increasing regulations (cf. section 2). In extant literature on ERP systems, few articles are concerned with the service sector (cf. Addo-Tenkorang and Helo, 2011; Moon, 2007), and to the best of our knowledge, we are not aware of articles regarding ERP systems particularly within the insurance sector. Because data quality needs to be managed context-dependently, the impact of using standardized ERP systems on DQM remains an open question. Therefore, this paper aims at answering the following research question: *How are ERP systems used to address data quality issues in the insurance sector?*

We conducted 15 semi-structured expert interviews with participants involved in IT-strategic decision-making in German insurance organizations. We show ERP systems' importance for large insurance organizations to ensure data quality after M&A and to fulfill regulations. Due to their positive impact on data quality, ERP systems are a starting point for effective and continuous data analysis.

In section 2, we provide the background on characteristics of the insurance sector and according research on ERP systems and DQM, followed by our research method and the study's context in section 3. In section 4, we present our findings starting with a short overview of DQM and ERP systems in the examined organizations. We then provide the identified data quality issues and the use of ERP systems in the insurance sector. The findings are elaborated in detail by providing citations of participants' statements. The findings are discussed in section 5, followed by a conclusion.

2 Background

A data quality definition broadly applied is data's fitness for its intended use or task by users (e.g., Madnick et al., 2009; Wang and Strong, 1996), emphasizing data quality's context-dependency. An important milestone for data quality research was the adoption of the data user's view, treating data as a product (Wang and Strong, 1996). Classifications of data quality dimensions and a discussion of the dimensions mostly referred to can be found in Batini et al. (2009). There is neither a general agreement on which set of dimensions defines data quality, nor about the exact meaning of each dimension (Knight, 2011; Cappiello et al. 2003/2004). Instead of specific dimensions or intrinsic, and rather objective, dimensions, our definition used in the interviews focuses on general contextual aspects: Data and information quality describes the information's fitness for its intended use or task by users or user groups. Users can be internal as well as external information consumers. Data quality can be measured by several quality dimensions. The quality is measured with regard to the user requirements and the intended use. DQM includes definition, measurement, and optimization of data quality. Since we consider data for its intended use, we use data quality and information quality synonymously. ERP systems are commercial software packages enabling data integration across an organization (Haug et al., 2009; Davenport, 1998). Furthermore, ERP systems are commonly used as enterprise-wide standard software systems to integrate and optimize transactions and core business processes across several functions (Addo-Tenkorang and Helo, 2011). We adopt this definition from

the manufacturing sector, although the integration of standard ERP systems is limited within service organizations (Glowalla and Sunyaev, 2012a; Botta-Genoulaz and Millet, 2006).

The insurance sector and related research is divided into life, non-life, and composite insurers[1] (e.g., Eling and Luhnen, 2010; Fenn et al., 2008). For instance, in Germany, insurers are bound to establish separate legal entities for life, health, and property-liability insurance, which can be coordinated within a group (Mahlberg and Url, 2010). The unification and deregulation of the European financial service sector had a major impact on the insurance sector. The concept of the single European market allows insurance organizations to expand under common regulations throughout Europe (Mahlberg and Url, 2010; Fenn et al., 2008). Deregulation led to an unprecedented number of M&A (Fenn et al., 2008). M&A lead to fundamental changes within the IT landscape as both, data and processes, need to be integrated. IS are the basis for integrating organizations after M&A, especially in financial services, where IS provide about 60% of the basis for potential synergies (Henningsson and Carlsson, 2011). ERP systems are only one possible integration-architecture, providing enterprise-wide integration, and their adequacy depends on the supported functions, channels, and significance of the IS (Cappiello et al. 2003/2004; Markus, 2000).

Insurance companies underlie several regulations (Beltratti and Corvino, 2008). Besides reporting standards such as the International Financial Reporting Standards (IFRS) (Lindberg and Seifert, 2010) or Health Insurance Portability and Accountability Act (HIPAA) (Grabski et al., 2011), the directive 'Solvency II', likely coming into effect in 2014, demands increased transparency to guard insurance organizations and their customers against various economic risks (European Commission, 2011). Thus, insurance providers will face new requirements to deliver reports and will need to prepare for the upcoming requirements (Höring and Gründl, 2011). Compliance with regulations is a key issue in ERP system and accounting research (Grabski et al., 2011). Such regulations affect the usage of ERP systems, but even implementation of sector-independent regulations might lead to technical, cultural, and process issues (Grabski et al., 2011; Kumar et al., 2008).

A key issue in the insurance sector is data analysis, ranging from general applications, such as customer relationship management, to more specific ones, such as insurance fraud detection (Kulkarni and Devale, 2012; Ngai et al., 2011). Insurance providers heavily rely on storing, processing, and using information and therefore are considered information-intensive organizations (Bassellier et al., 2003). ERP systems' databases provide a basis for data analysis and according applications (Grabski et al., 2011). However, current research shows the diversity of data analysis applications, which are applied depending on the underlying context (Chen et al., 2012).

We broaden our background beyond the insurance sector in order to gain an overview of ERP systems addressed in a DQM context. Extant research combining DQM and ERP systems focuses on manufacturing organizations and ERP system implementation projects (e.g., Haug et al., 2009; Strong and Volkoff, 2005; Gattiker and Goodhue, 2004; Vosburg and Kumar, 2001) and only few articles consider the post-implementation phase (e.g., Grabski et al., 2011; Haug et al., 2009) or service organizations (Botta-Genoulaz and Millet, 2006; Xu et al., 2002). Further articles focus on data quality improvement of ERP systems' data (e.g., Su et al., 2010; Xiaosong et al., 2008). Extant research is limited in two ways: First, research on the use and integration of ERP systems and their use for DQM in service organizations is lacking. Second, research focuses on the impact of data quality on ERP systems or the integrated data's improvement due to ERP system integration, but neglects a post-implementation perspective on ERP systems and their impact on data quality and its management. The focus on the implementation phase might be explained with data quality being a critical factor for ERP system's implementation success (Momoh et al., 2010). The focus on implementation seems to be a general issue of ERP system research (Staehr et al., 2012). In contrast, Staehr et al. (2012) explain factors important for ERP system's long-term post-implementation success. In this context, data quality has an impact on achievements of business benefits. Furthermore, education and understanding

[1] We use the term composite insurers in order to refer to insurers providing both, life and non-life insurance.

of requirements for data quality are key concepts. Such a contextual perspective on DQM is even more important in the information-intensive insurance sector. We address both research gaps by examining already implemented ERP systems in the insurance sector from a DQM perspective.

3 Research Approach

In order to examine the impact of ERP systems on data quality issues in the insurance sector, we selected organizations with already implemented ERP systems providing insurances in Germany. We chose semi-structured interviews as the most suitable method given the exploratory nature of our study. Although informed by literature, we applied this interview technique for posing open questions and following up on new aspects (Kvale, 2007). Additionally, we used public sources (most notably business reports) in order to get a more detailed overview of the organizations. Since access to suitable organizations and participants for expert interviews is an issue (Flick et al., 2009), we cooperated with a consulting organization that has its focus in financial services. We conducted 15 interviews in 14 insurance-related organizations, 10 of which fit our selection specification (cf. Table 1). The remaining organizations are no insurance providers (shaded dark-grey) or do not have ERP systems implemented (shaded light-grey). For ensuring the promised anonymity of organizations and participants (Walsham, 2006), we provide an aggregated presentation of the insurance providers and participants. All but one of the organizations focus on the German insurance market. According to the companies' total assets at the country level, all but one of the organizations can be considered large (cf. Eling and Luhnen, 2010).

We conducted the interviews in 2011 and 2012, choosing participants with respect to their knowledge and influence on IT strategy in the respective organizations. From our 15 participants (cf. Table 1), 13 are involved in IT-strategic decision-making as decision makers or direct advisors. All participants are experienced, with a minimum job experience in the financial service sector of 11 years and a mean of 19.8 years. We aimed for organization-specific insights to gain understanding of strategic trends the examined organizations deal with. We picked up strategic trends that were mentioned by the participants in the course of the interview with respect to the ERP system and DQM. This allowed identifying strategic trends from participants' perspective, which then were addressed in an ERP system and DQM context. The interview guideline was reviewed by an independent fellow researcher and a practitioner from our supporting organization. We conducted test interviews for validation, one with another fellow researcher and one with a managing director from an international organization.

Participant	Participants' position	Organizations' premium income in million euros	Organizations' no. of employees	Operating countries	Lines-of-business
#1	CIO	1000–5000	1000–5000	worldwide	composite
#2	head of IT	< 1000	< 1000	Europe	composite
#3	head of IT	1000–5000	1000–5000	Germany	composite
#4 / #6	enterprise architect / CIO	> 10000	> 10000	worldwide	composite
#5	head of IT	1000–5000	1000–5000	Germany	composite
#7	head of IT	< 1000	< 1000	Germany	life
#8	CIO	-	-	-	-
#9	executive board member	1000–5000	1000–5000	Europe	non-life
#10	CIO	< 1000	< 1000	Germany	non-life
#11	head of IT	5001-10000	5001-10000	Europe	non-life
#12	CIO	-	-	-	-
#13	enterprise architect	> 10000	> 10000	worldwide	composite
#14	head of IT	5001-10000	5001-10000	Germany	composite
#15	CIO	< 1000	< 1000	Germany	composite

Table 1. Participants and examined organizations.

The interviews took 37 to 75 minutes, on an average of 58 minutes. We recorded and transcribed the interviews, and sent them back to the participants for communicative validation (Flick et al., 2009) resulting in minor wording adjustments. We analyzed the interviews with regard to our guideline by iterative descriptive coding (Myers, 2011). Statements regarding, for instance, market developments, ERP systems, and DQM were categorized accordingly. Given the interpretive nature of our study, we wrote down assumptions and potential insights during interviews and coding for subsequent interpretation (Klein and Myers, 1999). The preliminary categorization was reviewed by an independent researcher followed up by iterative descriptive and interpretive coding (Myers, 2011) in order to saturate coding and allow for a context-specific interpretation of the findings. We applied a software tool (Huang, 2011) especially for meaning condensation and interpretation of statements in their original context (Kvale, 2007; Klein and Myers, 1999). We analyzed all interviews iteratively and again after all interviews were conducted, since data was collected throughout the study.

4 Findings

4.1 Overview of DQM and ERP systems in the examined organizations

We found DQM to be in an early state in all examined organizations. From the twelve organizations within our selection, five manage data issues ad-hoc. Another five organizations provide rudimentarily structured approaches to DQM: They have processes in place to address specific data issues or they start initiatives to identify and structure data within the organization. The remaining two organizations aim at automatizing DQM processes and transferring migration practices to continuous operational business in the near future. According to participants of three organizations, a first step in DQM seems to be the appointment of data owners.

Regarding the reasons for implementing ERP systems, the main strategic goal is the standardization within the organizational group, stated by six participants. Only in one organization the implemented and highly customized ERP system is not considered sustainable for future use. Participants from nine of the twelve organizations see a positive impact of ERP systems on data quality due to different reasons, such as build-in plausibility checks and standard reporting functions.

I directly increase data quality and procure ERP systems, which serve as systems for increasing data quality, and [the ERP systems] do not allow certain faults, which were possible with legacy systems. (head of IT, #03)

We have no extensive data quality problems [in our ERP system]. I am not a resolute fan of [ERP company name], but I think that the support within the development and the continuity in the [ERP company name] development environment and later during its use; that this has a positive impact. (enterprise architect, #04)

The positive impact affects preceding and subsequent systems, which was mentioned by four participants. For instance, due to data aggregation in ERP systems, flawed data can be identified.

The ERP system has several links into the whole landscape […]. And in the end, the ERP system, although being a receiving system that actually gets aggregated data only, has the requirement that all data can be traced back very detailed into the inventory control system. And that is a question of data quality as well. […] Insofar, the ERP system mostly has a backlash on the delivering systems. (head of IT, #11)

With respect to DQM, we found following strategic trends relevant in the insurance sector: (1) M&A, (2) regulations, and (3) data analysis. M&A was mentioned by seven of the 15 participants, whereas the high and still increasing grade of regulations in the insurance sector was addressed by 14 participants. Data analysis was mentioned by eight participants. Table 2 presents the statements regarding DQM and ERP systems in the context of the strategic trends. No statements are available combining DQM and ERP in the data analysis context. The statements are elaborated in detail in the next sections.

Strategic trends	DQM statements	Supported by	ERP system statements	Supported by	DQM/ERP statements	Supported by
M&A	M&A lead to dissimilar data landscape	#04, #06	ERP systems used for integration after M&A	#01, #04, #05, #06, #11, #14	ERP system used to integrate data after M&A	#01, #06, #11
	Integrate data after M&A	#01, #03, #05	Especially used for accounting	#01, #05, #11, #14		
Regulation	Increasing requirements for data quality due to regulations	#07, #09, #11, #15	ERP system used for fulfilling regulations	#01, #09, #14, #15	ERP facilitates DQM for fulfilling regulations	#01, #05, #14, #15
	Increased need for DQM due to regulations	#01, #04	Regulations have impact on ERP system	#01, #03, #04, #05, #06, #07, #11, #14, #15		

Strategic trends	DQM statements	Supported by	ERP system statements	Supported by
Data analysis	Data analysis used for fulfilling regulations	#04, #09, #15	Data analysis is beyond ERP system	#03, #06
	Data analysis necessary beyond regulations	#01, #04	Data warehouse used for data analysis (beyond regulations)	#06, #09
	Longevity of products challenges data analysis	#10		
	Data analysis used for distribution	#04, #06		
	Data analysis used for product development	#10, #15		
	Data analysis used for company strategy, operative business, and for process controlling/performance	#04		
	Data analysis used for customer relationship management	#06		
	Customer and public external data used for analysis	#04, #06		
	Process data used for analysis	#04, #10		

Table 2. Statements on DQM and ERP systems in the context of the strategic trends.

4.2 Mergers & Acquisitions

After M&A, organizations need to cope with heterogeneous data, processes, and IT systems. Two participants bring up issues with product and contract data in different M&A projects without mentioning a need for integrating or standardizing data. Three participants address the general need and conducted efforts to integrate data after M&A in order to achieve one consistent data basis.

Independent of the organizations, even reinsurers, they have the same terms and definitions and data we have. […] Then you map the data for transferring them into another system (CIO, #01)

ERP systems play a major role in M&A since standardization within organizational groups is the main strategic goal of ERP systems implementation. According to four participants, ERP systems are used for organizational alignment after M&A, especially for accounting. The focus of ERP systems with respect to DQM is on standardizing accounting across sites, leading to integration of data as well.

Usually M&A have highest priority and we aim at standardized systems across the organizations, which bring their own systems. Thus, [data] migrations are necessary. When we merged with another organization, we had to decide on a standard system for financial accounting. (CIO, #01)

The most important goal was standardized accounting after merging the organizations. A standardized system is necessary for all sites for controlling. Otherwise the terms[' definition] would differ. (enterprise architect, #11)

Despite our post-implementation perspective, M&A may lead to ERP system implementation at acquired sites. Integration may take several years. In one worldwide operating organization, the organizational sites use ERP systems from different vendors. Although the organization agreed on an ERP system, the M&A took place over three years ago and the sites still have their original ERP systems implemented. Even as the organization's management considers a common ERP system important for data lineage and problem clarification with regard to accounting, integration of basic infrastructure and core process systems took precedence. Another organization integrates its acquired smaller sites throughout Europe gradually, not considering it a priority. In a nationally operating organization, it took almost ten years to integrate accounting in a common ERP system. Thus, ERP system and according data integration cannot be claimed a high priority after M&A.

4.3 Regulations

Regulations are associated with a need for high data quality, especially for reporting. In order to conform to regulations, six participants mention increased need for data quality or DQM.

We have SarbOx, more controls and regulations we need to fulfill. And recently in the insurance sector, of course, Solvency II. We need to be able to maintain our control processes and we need a concept for data management, data ownership. (CIO, #01)

Due to the requirements from Solvency, we need to gather and calculate much more detailed information. I see a process coming up, which challenges many areas of our company. (CIO, #15)

All but one of the participants in insurance organizations with an ERP system state the dependency between ERP systems and regulations. Three participants mention the use of the ERP system for fulfilling current and upcoming regulations.

Things like Solvency II certainly concern the ERP system; generally the issue regarding controls, control reports. Of course, I expect that the system supports the whole thing. For instance, [ERP system vendor] does it well, with each release providing tools for control reports. (CIO, #1)

I assume what is currently there, for instance IFRS 5, that these functionalities, which currently are missing in the general ledger, will be provided in future releases. (executive board member, #09)

The other way around, nine participants address the impact of regulations on ERP systems, which is a major aspect since new requirements for financial reporting occur.

The ERP system needs to be adjusted if new releases are implemented, leading to great efforts. If we implement new products or product types, then we adjust the ERP system, but not very much. The biggest effort is due to legislative regulations. (head of IT, #07)

Because of Solvency II, we should think about how to consider this within the ERP systems in order to have a chance to calculate our numbers in increasingly shorter cycles and to control for data's consistency. (CIO, #15)

In the remaining organization, which is one of the smallest in our study with only one line-of-business, the ERP system was replaced by a self-developed system in order to gain flexibility, and is currently used only for materials management.

Now we have a self-developed system and we can quickly react to market requirements, internal and external process optimization as well as regulative requirements. Regulative requirements usually are developed for enterprises, not for medium-sized companies. (CIO, #10)

When participants refer to DQM and ERP systems in the context of regulations, the statements are implicit, rather referring to the provided functions for fulfilling regulations than directly addressing a positive impact on data quality.

When we have the standardized data in the central ERP system, we are able to fulfill the legislative requirements. (head of IT, #14)

Two participants refer to data warehouses for fulfilling regulations, allowing data lineage and adequate reporting. Both participants work at internationally operating organizations and one participant emphasizes the need to use merged data from data warehouses in different organizational sites across lines-of-businesses in order to fulfill regulations.

4.4 Data analysis

Data analysis and the entailed need for high data quality are diverse regarding the purpose of data analysis as well as the input data. Since ERP systems are used for administrative functions, their use for data analysis is limited. Participants do not consider ERP systems in the data analysis context or explicitly point out their limitation. When referring to specific systems for data analysis, participants mention data warehouses beyond the fulfillment of regulations.

Business intelligence is conducted on data across the system landscape, not only with the ERP system's data. (head of IT, #03)

We currently conduct data warehouse projects in order to systemize data mining. (CIO, #06)

Four participants link data analysis to regulations as well. In order to fulfill regulations, data analysis is necessary to generate reports out of the organizations' data. Nevertheless, two participants explicitly state the need to engage in data analysis beyond given obligatory requirements.

Longevity of insurance products is addressed by three participants. One participant links this issue to data analysis for product development. Due to the long lifecycle of insurance products, especially regarding life insurance, several products and product versions have to be managed and changes are visible with high delay. Thus, insurance providers have an above-average planning horizon.

Since an insurance provider has a perspective of at least ten to fifteen years, it is interesting to know, on which basis rate and product calculations etc. can be made. If launching a new life insurance product, the consequences would be perceived in perhaps sixty, seventy years. (CIO, #10)

One CIO explained their approach to data analysis in more detail, focusing on issues of contextual DQM. Within the organization, data analysis was extended across formerly disjoint data and users. When merging different data or using data in a new context, data users need to understand the data as well as their implications and limitations for the analysis task to gain valid results.

That has to be understood. That one person being used to say 'I have fairly robust numbers. After extrapolating these over the next five years, than the result is right and the deviation is this' now is forced to work with numbers, where another person says: 'The inaccurateness is much greater and you cannot presume, that it will be that way, but there are other scenarios that might occur.' (CIO, #15)

5 Results and Discussion

5.1 Use of ERP systems in DQM in the insurance sector

Our findings on the use of ERP systems in DQM show that ERP systems fulfill two main tasks in the insurance sector. First, ERP systems are used for data integration after national and international M&A. Second, ERP systems ensure data quality for fulfilling regulations. Both areas overlap due to the use of ERP systems for accounting. Participants rather mention a major impact of increasing regulations on ERP systems than considering ERP systems to fulfill regulations entirely. Therefore, subsequent systems, such as data warehouses, may gain increased importance in light of continuously increasing regulation requirements. Despite the integration efforts due to M&A and the need for continuous adjustments due to regulations, ERP systems are sustainable. Two potential explanations are that (a) ERP system vendors are expected to provide for upcoming regulations in future releases (cf. section 4.3) and (b) ERP systems are considered having a positive impact on preceding and subsequent systems' data quality (cf. section 4.1). Beside the positive impact of ERP systems on data quality, the initial stage of DQM has to be considered (cf. Glowalla and Sunyaev, 2012b). If focusing on accounting and regulation implementation, data quality might be high, but organizations adopt the perspective of the respective legislative body for DQM. When it comes to data analysis, participants neglect statements about the use of ERP systems in favor of data warehouses. From diverse data which is available for analysis, accounting data is only a part. Data analysis in administrative functions might

be seen as obligatory, not bringing competitive advantage. Nevertheless, the tasks of fulfilling regulations and data analysis overlap. Data analysis purposes are not addressed in detail by participants and further insurance-specific purposes (e.g., insurance fraud detection) were not mentioned at all. Due to the plethora of analysis possibilities, we argue that the insurance sector needs more sophisticated DQM for context-specific and purposeful data analysis.

In the insurance sector, we see ERP systems an adequate starting point for data analysis due to their (1) primary use for accounting, (2) their positive impact on data quality, additionally affecting preceding and subsequent systems, and (3) an overlap of regulations fulfillment and data analysis. We see missing contextual DQM a main impediment for data analysis. Therefore, cultural and managerial issues need to be addressed (LaValle et al., 2011) to lever ERP systems' potential. Extant IS literature on data analysis and big data focuses on technical issues, emphasizing the need for contextual approaches (Pospiech and Felden, 2012). There is need for further research to identify insurance-specific requirements for M&A, regulations, and data analysis and on how to lever ERP systems' potential.

ERP systems may affect data quality negatively at the local organizational level due to the increased need for complete and accurate data at the global level (Strong and Volkoff, 2005). Drawing on organizational information processing theory, Gattiker and Goodhue (2004) state that ERP system costs increase with differences among organizational sub-units. In the context of the insurance sector, this assumption might hold as well with the need to establish separate legal entities for life, health, and property-liability insurance and the differences in life and non-life. Further research focusing on lines-of-business and across different organizational sites is necessary to assess local and global effects of ERP systems and provide further guidance for ERP system use and integration in a DQM context.

We concur with Botta-Genoulaz and Millet (2006) that full integration based on ERP systems is unlikely and differences between lines-of-business in the insurance sector are an additional issue. High product complexity impedes development of comprehensive standard software, leading to a high rate of individual software in the insurance sector (Glowalla and Sunyaev, 2012a). Despite the specific characteristics of the insurance sector (cf. section 2), we derive guidelines for ERP system use in DQM for M&A, regulations, and data analysis that provide insights relevant across sectors.

5.2 Use of ERP systems in DQM across sectors

ERP system use in DQM for M&A: Lever ERP systems to integrate data after M&A for consistent data mapping and understanding. With ERP systems being used for accounting, especially there, they provide an integration basis across organizations. However, do not overestimate importance of accounting integration into one ERP system, since coupling of these functions might be low across organizations. Considering integration of other functions, significance and coupling of data need to be assessed before choosing an integration architecture to avoid redundant and inconsistent data. In manufacturing organizations, consolidation of ERP systems might have a higher priority due to their broader integration and support of core functions (cf. section 2; Botta-Genoulaz and Millet, 2006).

ERP system use in DQM for regulations: Lever ERP systems' positive impact on data quality for fulfilling regulations. Especially when applying ERP systems for organization-specific or local regulations, assess the ERP system and its data critically and contact your vendor to check for potential future releases providing functions needed. Consider the ERP system in a broader organizational DQM context to avoid adopting the data quality perspective of the ERP system or legislative body. Additionally, evaluate existing data analysis applications for fulfilling regulations.

ERP system use in DQM for data analysis: Before engaging in extended data analysis, review general and organization-specific data analysis possibilities, including necessary data. Use ERP systems' positive impact on data quality and lever accounting data for initial data analysis. According to a quantitative study with over 3000 executives, managers and analysts, accounting is a starting point for data analysis across sectors (LaValle et al., 2011). Be aware of the potentially limited perspective

in data analysis and, thus, in decision-making. Use initially acquired skills to extend data analysis, for instance, beyond obligatory requirements. Consider the need to redefine and reassess data quality even if using standardized ERP system data. When aiming for new insights using data from ERP systems, the ERP system's and additional data are set into a new context, processed with a new purpose. Even if data's quality is high for original tasks, missing context-sensitivity might lead to unexpected challenges.

Generally, organizations should consider data's purpose, especially if data is used in a new context. Appointing data owners might lead to improvement of data quality for specific tasks across systems and departments, but it does not necessarily account for a new context. Extant research corroborates the importance of understanding data and its purpose across stakeholders (e.g., Knight, 2011). This holds for ERP systems as well (e.g., Staehr et al., 2012). However, when assessing data quality in ERP systems, due to standardized data and tasks, an intrinsic perspective is more important from an operational perspective (Haug et al., 2009; Vosburg and Kumar, 2001). In contrast, data needs to be understood for long-term ERP system success from a business perspective (Staehr et al., 2012). An intrinsic perspective is a potential pitfall, especially in information-intensive sectors and for data analysis, where diverse data is used across contexts.

5.3 Limitations

Due to the explorative and country as well as sector-specific approach and the number of organizations, generalization is limited but possible through specific implications and rich insights (Walsham, 2006). The selection of participants involved in IT-strategic planning limits the study's perspective. For instance, other data quality issues might be relevant from functional accounting or distribution perspective. A focused case study approach should examine our findings more detailed.

6 Conclusion

We conducted 15 semi-structured interviews in the German insurance sector with experts responsible for IT-strategic decision-making, revealing current practices of ERP systems' use. ERP systems play an important and sustainable role for DQM in the insurance sector. ERP systems' use for administrative functions, particularly for accounting, might facilitate DQM after M&A and for fulfilling regulations in large insurance organizations. Moreover, ERP systems provide a starting point for data analysis. Due to ERP systems' positive impact on data quality, organizations are able to focus on cultural and managerial issues, which are primary concerns when putting data into new contexts.

We add to the current body of knowledge by examining ERP systems in the insurance sector from a contextual perspective since extant ERP research focuses on the manufacturing sector. Some issues, for instance the intrinsic DQM perspective on ERP systems, are more severe in the information-intensive insurance sector. We corroborate the limited integration of ERP systems in the insurance sector and show ERP systems' sustainable importance for DQM in large insurance organizations.

Our research provides guidance for ERP system use in DQM in the insurance sector and beyond. We support practitioners and ERP system vendors by presenting insights into application areas of ERP systems, their sustained use, and their positive data quality impact. To lever ERP systems' potential for data analysis, organizations need to consider ERP systems and their data from a contextual perspective to avoid pitfalls due to an intrinsic, regulation-centric view.

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